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Sustainability Initiatives

Sustainable Fleet Strategy: Framework & Action Plan

Prepared for the City of Brampton

June 2021

Framework & Action Plan – Overview

1) Results of various data models which evaluated the cost and GHG impacts of go-forward fuel-reduction solutions relative to the 2019 baseline over a 15-year budget cycle

2) Estimations of electric vehicle supply equipment (EVSE) requirements to model the cost of charging infrastructure over a 15-year budget cycle

3) An overview of purchasing v. leasing v. renting fleet assets and discounted cashflow analysis for rental units in the Transit (non-revenue) fleet

4) Recommendations for low-carbon fleet options and a structured, phased-in BEV transition to battery-electric vehicles (BEVs)

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RSI's Business Tools for Data Modelling

- Lifecyle Analysis (LCA) tool assesses optimal replacement cycles based on historical data and cash flow (used in Part One)

- Fleet Analytics Review™ (FAR) data-models scenarios around operating & capital costs, fuel usage and GHG reduction methods

These tools calculate if investments in fuel-efficient vehicles, technologies and best practices will be offset by Opex reductions.

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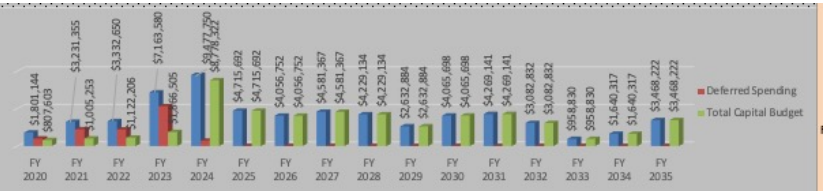
FAR™ Long-Term Capital Planning



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Liters of fuel used in period	Operating Expense Increase or Savings (-)	Unit #	Category	Current Fuel Type	Replacement Category	Replacement Fuel	Planned Life Cycle (years)	Fiscal Year 2020: Planned Capital Budget 2020 (Includes existing deferrals)	Fiscal Year 2020: Enter "DEF" to defer unit to next year or "NIX" to nix unit entirely	Fiscal Year 2020: Deferred Spending for 2020	Fiscal Year 2020: Total Capital Budget 2020	Fiscal Year 2020: Opex Increase or -Reduction from Unit Replacement & Greening Plan	Fiscal Year 2020: Opex Increase or -Reduction from Vehicle Category Switch with Replacement	Fiscal Year 2020: Opex Increase or -Reduction from Fuel Switch with Replacement	Fiscal Year 2020: Net CO_2 Reduction from Unit Replacement & Greening Plan	Fiscal Year 2020: CO_2 Reduction from Vehicle Category Switch	Fiscal Year 2020: CO_2 Reduction from Fuel Switch	Fiscal Year 2021: Planned Capital Budget 2021 (Includes deferrals from 2020)	Fiscal Year 2021: Enter "DEF" to defer unit to next year or "NIX" to nix unit entirely	Fiscal Year 2021: Deferred Spending for 2021
3,000	$580	99705	Cargo Van	G	Cargo Van	G	12	$53,901		$0	$53,901	$580	$0	$0	1.13	0.00	0.00	$0		$0
6,500	-$4,263	99706	Cargo Van	G	Cargo Van	G	12	$53,283		$0	$53,283	-$4,263	$0	$0	2.45	0.00	0.00	$0		$0
2,800	$198	99709	Van	G	Van	G	12	$0		$0	$0	$198	$0	$0	0.94	0.00	0.00	$0		$0
6,300	$330	99710	Van	G	Van	G	12	$0		$0	$0	$330	$0	$0	2.12	0.00	0.00	$0		$0
10,000	$4,555	99707	Cargo Van	G	Cargo Van	G	12	$51,313		$0	$51,313	$4,555	$0	$0	3.77	0.00	0.00	$0		$0
5,000	$226	99712	Van	G	Van	G	12	$0		$0	$0	$226	$0	$0	1.68	0.00	0.00	$0		$0
3,000	$111	99713	Van	G	Van	G	12	$0		$0	$0	$111	$0	$0	1.01	0.00	0.00	$0		$0
8,000	$247	22516	Van	D	Van	D	12	$0		$0	$0	$247	$0	$0	2.97	0.00	0.00	$0		$0
4,038	$205	13191	Pickup	G	Pickup	BEV	13	$0		$0	$0	$205	$0	$0	1.36	0.00	0.00	$0		$0
1,979	$140	13207	Pickup	G	Pickup	BEV	13	$0		$0	$0	$140	$0	$0	0.67	0.00	0.00	$0		$0
1,341	$74	13221	Pickup	G	Pickup	BEV	13	$0		$0	$0	$74	$0	$0	0.45	0.00	0.00	$0		$0
1,107	$72	13222	Pickup	G	Pickup	BEV	13	$0		$0	$0	$72	$0	$0	0.37	0.00	0.00	$0		$0
2,124	$141	13606	Pickup	G	Pickup	BEV	13	$0		$0	$0	$141	$0	$0	0.71	0.00	0.00	$0		$0

About FAR | Guide to FAR | Assumptions | Benchmark Cost | FAR Input Form On-Road Fleet | Baseline | **5 Yr. Capex Status Quo On-Road** | Capex Charts | KPI Graphs | FAR Baseline Cat. Avg's. | FAR Baseline KPI Report

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Low-Carbon Fleet Plan Planning

- Group One Solutions: Best management practices (BMPs)
  - Enhanced specs: light-weighting, lower-rolling resistance (LRR) tires
  - Driver behaviours: eco-training & anti-idling policy/technologies
  - Transportation demand management (TDM): route-planning/optimization & trip reduction
- Group Two Solutions: Fuel-switching
  - E85, B10, CNG, LPG for appropriate units
- Group Three Solution: BEV phase-in
  - Deferred replacement of ICE units until BEV replacements available

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FAR Scenario No.	Year of Implementation	Solution	Notes
1	2020	Baseline BAU	2019 used as proxy for 2020
2	2021	Optimized Lifecycles (all units)	Optimized via LCA
3	2021	Balanced Capex and Optimized Lifecycles (all units)	Balanced year over year based on LCA and ROI to year 2035 – remaining scenarios will build on this
4	2021	Enhanced specs: light-weighting, LRR (all units)	
5	2021	Driver behaviours: eco-training & anti-idling policy/technologies (all units)	
6	2021	TDM: route planning/optimization & trip reduction (all units)	
7	2021	All house-in-order strategies (all of solutions 3, 4, 5 & 6) (all units)	Remaining scenarios will build on this
8	2021	Fuel Switch: E85 (all flex-fuel units)	
9	2021	Fuel Switch: B10 (annualized blend – all diesel on-road units)	
10	2021	Fuel Switch: CNG LMHD (all applicable units)	Annual vehicle cost to include shared capital cost for one CNG fast refueller system costing $1.68m per 50 CNG units
11	2021	Fuel Switch: LPG LMHD (all applicable units)	Annual vehicle cost to include shared capital cost for one LPG fast refueller system costing $68k per 50 LPG units
12	2021	Hybrid conversion (Class 3-5 Fire & EMS units only)	Hybrid conversion cost to be $25k per unit with fuel efficiency increase of 25%
13	2021	BEV Phase-in: LD (cars & SUVs only)	Cost for replacement with BEV to be 20% more than ICE vehicle being replaced; cost of charging infrastructure modelled separately
	2022	BEV Phase-in: LD (cars, SUVs, pickups, vans only)	
	2023	BEV Phase-in: LD (cars, SUVs, pickups, vans only)	
	2024	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2025	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2026	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2027	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2028	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2029	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2030	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2031	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2032	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2033	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2034	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2035	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	
	2036	BEV Phase-in: LMHD (cars, SUVs, pickups, vans, Class 3 to 8 trucks; Fire & EMS LD only)	

Data-Modelling – Summary of Fleet-Wide Results

Group	FAR Scenario Description	Implementation Timing	Average Annual Vehicle Replacement Capex ($ mil)	Average Annual Opex Impacts Over 2019 Baseline ($ 000s)	Annual Tailpipe GHG Reduction Over 2019 Baseline (tonnes CO_2e)	Annual Tailpipe GHG Reduction Percentage Over 2019 Baseline
One	Enhanced specs: light-weighting, LRR (all units)	Immediate	7.4	+217	230	6%
	Driver behaviours: eco-training & anti-idling policy/technologies (all units)	Immediate	7.4	+205	812	21%
	Route planning/optimization & trip reduction (all units)	Immediate	7.4	+203	637	16%
	All BMPs (all solutions above, for all units)	Immediate	7.4	+227	1,372	35%
Two	Fuel switch: E85 (all flex-fuel units)	Immediate	7.4	-128	2,137	54%
	Fuel switch: B10 (annualized blend – all diesel on-road units)	Immediate	7.4	-119	1,512	38%
	Fuel switch: CNG (all applicable units)	Immediate	7.4	-472	1,849	47%
	Fuel switch: LPG (all applicable units)	Immediate	7.4	-437	1,599	41%
Three	BEV phase-in: cars & SUVs starting immediately, pickups & vans starting in 2022, vans, and medium- and heavy-duty (MHD) trucks starting in 2024; includes Fire & EMS light-duty (LD) phase-in only	Immediate - 2035	7.9	+315	3,376	86%

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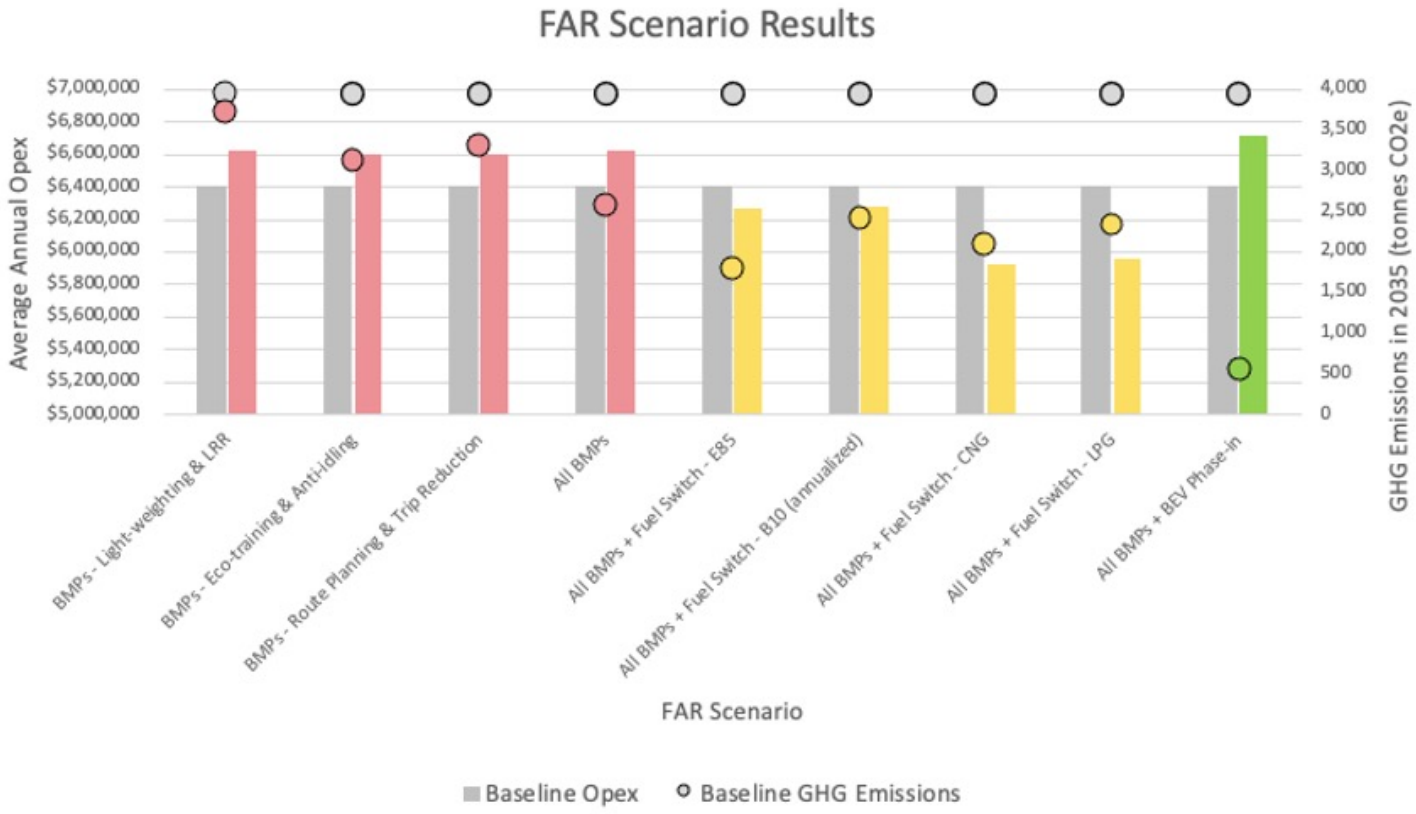
Data-Modelling – Summary of Fleet-Wide Results



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Data-Modelling – Summary of Fleet-Wide Results

- Driver eco-training and anti-idling policy/technologies, if fully implemented fleet-wide, have the greatest GHG-reduction of all BMPs, based on our modelling.
- Switching all flex-fuel units to ethanol 85 (E85) has the greatest GHG-reduction potential of all fuel-switching options, based on our modelling.
- All fuel-switching solutions, particularly compressed natural gas (CNG), are shown to be cost-effective at the fleet-wide level, based on our modelling.
- Transitioning to BEVs is the most effective long-term GHG-reduction solution for Brampton's fleets, but it does come at a slightly higher cost based on our modelling.

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Low-Carbon Fleet Plans

- For planning purposes, for each sub-fleet we have encapsulated scenario results into a single long-term capital planning strategy (LTCP). Results include:

1) The immediate impacts (i.e., model year one, 2021, only) of viable BMPs (Group One solutions)

2) Fuel-switching solutions (Group Two solutions).

3) Year-by-year impacts of battery-electric vehicle (BEV) phase-in (Group Three solution)

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Low-Carbon Fleet Plan – Fleet Services

Group	FAR #	FAR Scenario Description	Implementation Timing	Annual Vehicle Replacement Capex ($ mil)	Annual Opex Impacts Over 2019 Baseline ($ 000s)	Annual Tailpipe GHG Reduction Over 2019 Baseline (tonnes CO_2e)	Annual Tailpipe GHG Reduction Percentage Over 2019 Baseline
-	1	Current lifecycles	2021	28.2	-820	27	1%
	2	Optimized lifecycles	2021	25.5	-640	20	0.5%
	3	Balanced Capex using optimized lifecycles	2021	7.5	-330	5	0.1%
One	4	Enhanced specs: light-weighting, LRR (all units)	2021	7.5	-310	161	4%
	5	Driver behaviours: eco-training & anti-idling policy/technologies (all units)	2021	7.5	-320	753	19%
	6	Route planning/optimization & trip reduction (all units)	2021	7.5	-330	576	15%
	7	All BMPs (all solutions above, for all units)	2021	7.5	-300	1,324	34%
Two	8	Fuel switch: E85 (all flex-fuel units)	2021	7.5	-620	2,101	53%
	9	Fuel switch: B10 (annualized blend – all diesel on-road units)	2021	7.5	-610	1,467	37%
	10	Fuel switch: CNG (all applicable units)	2021	7.5	-930	1,810	46%
	11	Fuel switch: LPG (all applicable units)	2021	7.5	-900	1,555	39%
Three	13	BEV phase-in: cars & SUVs	2021	6.0	+30	1,339	34%
		BEV phase-in: cars, SUVs, pickups, vans	2022	5.0	-352	1,658	42%
		BEV phase-in: cars, SUVs, pickups, vans	2023	6.2	-68	2,000	51%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2024	12.0	-331	2,290	58%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2025	9.5	+155	2,487	63%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2026	9.6	+368	2,748	70%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2027	4.3	+307	2,893	73%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2028	7.4	+491	3,012	76%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2029	6.6	+546	3,178	81%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2030	5.9	+478	3,311	84%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2031	11.8	+479	3,361	85%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2032	10.3	+622	3,375	86%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2033	9.2	+815	3,376	86%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2034	6.2	+522	3,376	86%
		BEV phase-in: cars, SUVs, pickups, vans, Class 3 to 8 trucks	2035	8.3	+664	3,376	86%

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Low-Carbon Fleet Plan – Fire & EMS

Group	FAR #	FAR Scenario Description	Implementation Timing	Annual Vehicle Replacement Capex ($ mil)	Annual Opex Impacts Over 2019 Baseline ($ 000s)	Annual Tailpipe GHG Reduction Over 2019 Baseline (tonnes CO_2e)	Annual Tailpipe GHG Reduction Percentage Over 2019 Baseline
-	1	Current lifecycles	2021	17.5	-0.25	5	0.6%
	2	Optimized lifecycles	2021	17.5	-0.25	5	0.6%
	3	Balanced Capex using optimized lifecycles	2021	5.7	-77	2	0.3%
One	4	Enhanced specs: light-weighting, LRR (all units)	2021	5.7	-74	33	4%
	5	Driver behaviours: eco-training & anti-idling policy/technologies (all units)	2021	5.7	-73	149	19%
	6	Route planning/optimization & trip reduction (all units)	2021	5.7	-74	114	15%
	7	All BMPs (all solutions above, for all units)	2021	5.7	-66	261	34%
Two	8	Fuel switch: E85 (all flex-fuel units)	2021	5.7	-100	344	44%
	9	Fuel switch: B10 (annualized blend – all diesel on-road units)	2021	5.7	-144	297	38%
	10	Fuel switch: CNG (all applicable units)	2021	5.7	+83	365	47%
	11	Fuel switch: LPG (all applicable units)	2021	5.7	-155	307	40%
-	12	Hybrid conversion (Class 3-5 Fire & EMS units only)	2021	5.7	-69	264	34%
Three	13	BEV phase-in: cars & SUVs only	2021	5.7	-66	261	34%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2022	1.0	-70	273	35%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2023	2.1	-45	331	43%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2024	6.5	+1	341	44%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2025	5.2	+164	348	45%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2026	5.3	+304	354	46%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2027	0.4	+321	367	47%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2028	3.3	+354	386	50%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2029	1.1	+437	386	50%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2030	1.2	+435	387	50%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2031	8.2	+377	388	50%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2032	7.0	+481	389	50%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2033	5.8	+564	390	50%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2034	2.6	+520	390	50%
		BEV phase-in: cars, SUVs, LD vans & pickups only	2035	4.4	+505	390	50%

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Low-Carbon Fleet Plan – Transit (non-revenue)

Group	FAR #	FAR Scenario Description	Implementation Timing	Annual Vehicle Replacement Capex ($ 000s)	Annual Opex Impacts Over 2019 Baseline ($ 000s)	Annual Tailpipe GHG Reduction Over 2019 Baseline (tonnes CO_2e)	Annual Tailpipe GHG Reduction Percentage Over 2019 Baseline
-	1	Current lifecycles	2021	410	-26	0.8	0.2%
	2	Optimized lifecycles	2021	340	-28	0.8	0.2%
	3	Balanced Capex using optimized lifecycles	2021	56	-24	0.2	0.1%
One	4	Enhanced specs: light-weighting, LRR (all units)	2021	56	-23	17	4%
	5	Driver behaviours: eco-training & anti-idling policy/technologies (all units)	2021	56	-20	81	19%
	6	Route planning/optimization & trip reduction (all units)	2021	56	-20	62	15%
	7	All BMPs (all solutions above, for all units)	2021	56	-15	143	34%
Two	8	Fuel switch: E85 (all flex-fuel units)	2021	56	-77	293	69%
	9[1]	Fuel switch: B10 (annualized blend – all diesel on-road units)	2021	56	-31	150	35%
	10	Fuel switch: CNG (all applicable units)	2021	56	+248	189	44%
	11	Fuel switch: LPG (all applicable units)	2021	56	-71	166	39%
Three	13	BEV phase-in: cars & SUVs (owned units only)	2021	0	+15	142	34%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2022	357	-16	171	40%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2023	320	-7	238	56%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2024	200	+1	247	58%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2025	0	+4	247	58%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2026	0	+5	247	58%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2027	310	-12	267	63%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2028	346	-5	267	63%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2029	391	-7	304	71%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2030	345	-28	304	71%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2031	0	+3	304	71%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2032	61	-2	304	71%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2033	375	-7	304	71%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2034	142	+2	304	71%
		BEV phase-in: cars, SUVs, LD pickups (owned units only)	2035	93	+3	304	71%

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Electric Vehicle Supply Equipment Planning

- Two L3 chargers required at each of Fleet Services' major locations – Williams Parkway, Sandalwood Parkway, and Flower City Community Campus (FCCC)
- We used the following method to determine the number of BEVs that can share one L2 charger:
  - The average annual mileage for all in-scope Brampton fleet vehicles (owned and rented) is about 10,000 km. Dividing by about 250 work days/year gives a daily driving distance of 40km.
  - If we assume a typical minimum (winter) BEV range of 200km for most BEVs currently on the market, then one BEV would be able to last about four work days from full charge to about 50 km (25%) remaining.
  - Therefore, one BEV would need L2 charging about every four work days and the same charger can be used for multiple BEVs on a rotating basis – ideally four BEVs.
  - Realistically, we can safely assume that two L2 chargers would be needed for every four BEVs – or one L2 charger for every two BEVs.

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Electric Vehicle Supply Equipment Planning

- To determine the total number of L2 chargers required to serve the entire Brampton fleet (once transitioned to BEVs) – excluding heavy-duty (HD) fire trucks – we made the following estimations:
  - The number of BEVs added on a phased-in basis to Brampton's fleets exceeds the number of possible BEV replacements by around 2031; this means that the cost of any additional chargers past this point will essentially be redundant because BEVs will be replaced with BEVs.
  - We estimated about 600 possible BEV replacements by 2031. Therefore, when 300 L2 chargers are required.
  - A fleet should be outpacing the demand for EVSE to allow for a smooth transition. Therefore, we have estimated the number of L2 chargers required for purchase to outpace demand and to make use of the temporary pause in purchasing BEV medium- and heavy-duty (MHD) vehicles in 2022 and 2023.

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Electric Vehicle Supply Equipment Planning

- We made the following cost considerations:
  - Inclusion of the cost of 20 L2 chargers currently being installed at the Fire Campus, which has been partially funded by NRCan's Zero Emission Vehicle Infrastructure Program
  - The net cost of each L2 charger, after NRCan funding, from the installation at the Fire Campus, is $7,500. This figure has been used as a benchmark for all remaining L2 chargers, with 2% inflation added to the cost of L2 chargers year-over-year.
  - Net cost of L3 chargers estimated to be $60,000, assuming the City would provide 60% of the cost of a $100,000 L3 charger (the remaining 40% externally funded).

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EVSE Long-Term Costing Outlook

Year # of BEV Phase-in Plan	Year of BEV Phase-in	Location	Number of BEVs added to Brampton Fleets (per phase-in plan)	Cumulative Number of BEVs added to Brampton Fleets (per phase-in plan)	Number of BEVs Serviced by each L2 Charger	Number of L2 Chargers Required to Meet Demand	Number of L3 Chargers Required	Cumulative Number of L2 Chargers Required to Meet Demand	Estimated Number of L2 Chargers Required for Purchase (to outpace demand)	Estimated Cost per Charger (after grants & subsidies)	Total Cost of Chargers	Cumulative Cost of Chargers
1	2021	Williams Parkway	-		-	-	2	-	-	$60,000	$120,000	$120,000
	2021	Sandalwood Parkway	-		-	-	2	-	-	$60,000	$120,000	$240,000
	2021	Flower City Community Campus	-		-	-	2	-	-	$60,000	$120,000	$360,000
	2021	All Brampton Fleet Parking Sites	8	8	2	4	0	4	20	$7,500	$150,000	$510,000
2	2022	All Brampton Fleet Parking Sites	83	91	2	42	0	46	60	$7,650	$459,000	$969,000
3	2023	All Brampton Fleet Parking Sites	118	209	2	59	0	105	60	$7,803	$468,180	$1,437,180
4	2024	All Brampton Fleet Parking Sites	65	274	2	33	0	138	20	$7,959	$159,181	$1,596,361
5	2025	All Brampton Fleet Parking Sites	47	321	2	24	0	162	20	$8,118	$162,365	$1,758,726
6	2026	All Brampton Fleet Parking Sites	53	374	2	27	0	189	20	$8,281	$165,612	$1,924,338
7	2027	All Brampton Fleet Parking Sites	26	400	2	13	0	202	20	$8,446	$168,924	$2,093,263
8	2028	All Brampton Fleet Parking Sites	45	445	2	23	0	225	20	$8,615	$172,303	$2,265,565
9	2029	All Brampton Fleet Parking Sites	36	481	2	18	0	243	20	$8,787	$175,749	$2,441,314
10	2030	All Brampton Fleet Parking Sites	58	539	2	29	0	272	20	$8,963	$179,264	$2,620,578
11	2031	All Brampton Fleet Parking Sites	91	630	2	28	0	300	20	$9,142	$182,849	$2,803,427
12	2032	All Brampton Fleet Parking Sites	59	689	2	0	0	300	0	$9,325	$0	$2,803,427
13	2033	All Brampton Fleet Parking Sites	60	749	2	0	0	300	0	$9,512	$0	$2,803,427
14	2034	All Brampton Fleet Parking Sites	45	794	2	0	0	300	0	$9,702	$0	$2,803,427
15	2035	All Brampton Fleet Parking Sites	49	843	2	0	0	300	0	$9,896	$0	$2,803,427

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Purchasing v. Leasing v. Renting Fleet Vehicles

- Advantages of purchasing fleet vehicles:
  - No Mileage Restrictions. Vehicle owners are not subject to mileage or wear and tear limitations as with leases. The distance the fleet travels annually is solely up to the owner.
  - More Flexibility. Unlike leases, owners are not restricted to keep vehicles for a specific period. Fleet managers can remove a vehicle(s) from the fleet at any time and without penalties.
  - Pricing Leverage. Fleets can usually attract price concessions (discounts) from vehicle original equipment manufacturers' (OEMs) seeking their business.
  - Depreciation. Depreciation of vehicles' value is one of the highest fleet costs. Vehicle owners have more control over this number.
  - Equity. Vehicles will gain equity over time. If funds for purchasing are borrowed, ideally, the owner will gain positive equity meaning the amount the fleet owes for its vehicles is less than it is worth.

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Sustainability Initiatives

Purchasing v. Leasing v. Renting Fleet Vehicles

- Advantages of leasing fleet vehicles:
  - Preserving Capital. Leasing (or renting) preserves capital compared to owning vehicles, which can then be applied to other business requirements and priorities.
  - Less Maintenance and Fuel Costs. Since leased vehicles are typically newer models, they require fewer reactive repairs and, hence, overall maintenance costs and better fuel economy.
  - Off-Balance Sheet Treatment. Leasing is not as substantial an expense and can potentially be treated off the balance sheet, making an organization more attractive to lenders or investors.
  - Flexibility. Lease terms are generally shorter than ownership lifecycles, which may translate to a more modern fleet.
  - Less Administration. With a vehicle lease may come fewer administrative tasks, such as Preparing specifications, obtaining competitive bids, etc.

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Purchasing v. Leasing v. Renting Fleet Vehicles

- Advantages of renting fleet vehicles include:
  - A way to expand the fleet to meet a defined business need or to modernize the fleet by replacing aging fleet units without capital investment;
  - No upfront costs;
  - Covered maintenance and repair costs;
  - Replacement vehicles at no additional cost when primary rental units are out of service for repairs or maintenance; and
  - Little, and possibly no, downtime and associated costs.

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Discount Cash Flow Analysis for Transit Rentals (Sedans)

Vehicle Acquisition Option	Lifecycle Total Cost of Ownership - 40 Units	Savings or (Additional Cost) Over Lowest Cost Option
Option 1: Purchase	$3,431,399	$0
Option 2a: Closed End Lease	$3,850,007	($418,608)
Option 2b: Open End Lease	$3,689,404	($258,005)
Option 3: Rent	$3,651,353	($219,954)

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Summary of Key Recommendations

- Best Management Practices
  - Consider job suitability of vehicles before proceeding with light-weighting enhancements.
  - Consider a fuel-efficient driver incentive program in which drivers are incentivized to improve behaviours or reduce their travel.
  - Consider virtual meetings (post Covid-19 pandemic) and staff carpooling when possible.

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Summary of Key Recommendations

- Fuel Switching – E85 Ethanol
  - Consider E85 as a “messy-middle” solution while its fleet slowly transitions to battery electric vehicles (BEVs).
  - Consider a pilot project with several units switched to E85 to determine the fuel-efficiency loss and cost-effectiveness; if successful, consider switching other appropriate units.
- Fuel Switching – Compressed natural gas (CNG)
  - We recommend that Fleet Services consider CNG only as an optional, secondary GHG reduction solution for MHDVs, as a commitment to CNG fuelling infrastructure may not be a prudent choice for the long-term.

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Summary of Key Recommendations

- Battery-Electric Vehicle Phase-In
  - Consider a pause on purchasing new internal combustion engine (ICE) vehicles (when appropriate) for the short term (one year for pickups, three years for medium- and heavy-duty vehicles, while awaiting BEV counterparts to become available.
  - Consider allocating the majority of fleet capital spending on BEVs (for appropriate vehicle categories as BEV models become available).
  - Strictly through a lens of fiscal planning, our recommendation is to prioritize unit replacement of ICE units with BEVs that would deliver ROI – typically ones that have relatively high annual mileage.

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Summary of Key Recommendations

- Electric Vehicle Supply Equipment
  - In the short-term, we recommend that the City of Brampton allocate capital towards charging infrastructure required for the transition to BEVs for all vehicle categories.
  - The additional capital costs associated with electric vehicle supply equipment (EVSE) can be offset through reduced capital spending during the pause we are recommending for purchasing internal combustion engine (ICE) medium- and heavy-duty vehicles and pickups.

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Summary of Key Recommendations

- Collaboration/Partnership Approaches
  - We recommend collaborations such as multi-departmental funding applications for charging infrastructure, or sharing of BEV pilot program results to determine vehicles requirements and specifications (e.g., real-world range, real-world charging needs) ahead of large purchasing decisions involving many units.
  - We recommend potential collaborations such as joint specification writing and/or joint tenders, or, like internal partnerships, sharing of BEV pilot program results through working groups.

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Summary of Key Recommendations

- Risk/Change Management Approaches
  - We recommend creating a BEV educational piece for employees and operators summarizing the benefits of transitioning BEVs.
  - We recommend inviting frontline employees to take BEV test drives to build an affinity towards fully-electric vehicles and have first-hand experience of improved performance (e.g., instant torque, little noise, regenerative breaking).
  - We recommend that operators be provided a brief BEV orientation before starting to drive new models to become familiar with the different driving experience.

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Summary of Key Recommendations

- Purchase, Lease or Rent
  - Should Brampton ever be considering leasing as an alternative to purchasing or renting, the City should first issue an RFP or RFQ to determine these costs with absolute clarity.
  - Bid specifications for a vehicle leasing RFP/Q must be carefully prepared so that all cradle-to-grave leasing costs, including all service charges and fees, can be identified and evaluated.

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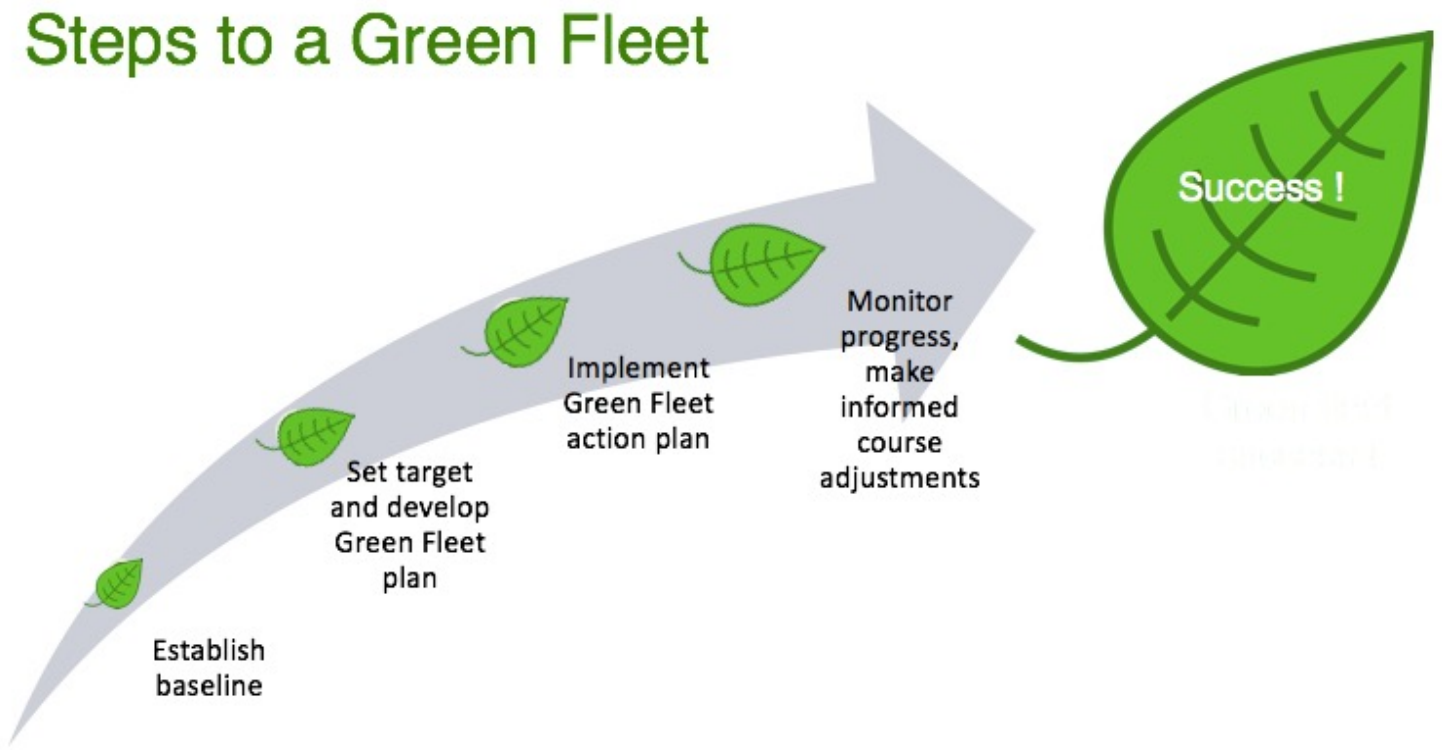
Sustainable Fleet Strategy – Implementation



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Discussion and Questions